Serial No.	Question Number	CO	Bloom's Taxonomy Level	Difficulty Level	Competitive Exam Question Y/N	Area	Topic	Unit	Marks
1	Classify the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+$ $E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, for following given value of A, B, C A=1 , B= 0, C=3	5	K4	L	N	PDE	Classification of second order PDE	5	2
2	Classify the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+$ $E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, for following given value of A, B, C A=-2 , B= 3, C=-4	5	K4	L	N	PDE	Classification of PDE	5	2
3	Classify the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+$ $E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, for following given value of A, B, C A= -4 , B=-2 , C=-1	5	K4	L	N	PDE	Classification of PDE	5	2
4	Classify the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+$ $E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, for following given value of A, B, C A= 2 , B=2 , C= 2	5	K4	L	N	PDE	Classification of PDE	5	2
5	Classify the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+$ $E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, for following given value of A, B, C A=-5 , B=-5, C=-5	5	K4	L	N	PDE	Classification of PDE	5	2
6	Classify the second order linear	5	K4	L	N	PDE	Classification	5	2

	PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, for following given value of A, B, C A=100, B=10, C=10						of PDE		
7	Classify the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, for following given value of A, B, C $\boldsymbol{A = x^2}$, $\boldsymbol{B = x^2 y}$, $\boldsymbol{C = x^3}$	5	K4	L	N	PDE	Classification of PDE	5	2
8	Classify the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, for following given value of A, B, C $\boldsymbol{A = x^2 y}$, $\boldsymbol{B = y^2}$, $\boldsymbol{C = x^5}$	5	K4	L	N	PDE	Classification of PDE	5	2
9	Classify the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, for following given value of A, B, C $\boldsymbol{A = y^3}$, $\boldsymbol{B = x^2}$, $\boldsymbol{C = y^2}$	5	K4	L	N	PDE	Classification of PDE	5	2
10	Find the region for which the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, is parabola/Hyperbola/Ellipse for following values of A, B, C, D, E ,F $\boldsymbol{A = x^{-3}}$, $\boldsymbol{B = (xy)^{\frac{-3}{2}}}$, $\boldsymbol{C = y^{-3}}$, $\boldsymbol{D = xy^2}$, $\boldsymbol{E = y^2}$, $\boldsymbol{F = y^2}$	5	K1	L	N	PDE	Classification of PDE	5	2
11	Find the region for which the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$, is parabola/Hyperbola/Ellipse for following values	5	K1	L	N	PDE	Classification of PDE	5	2

	of A, B, C, D, E ,F $\boldsymbol{A = x^3}$, $\boldsymbol{B = x^2}$, $\boldsymbol{C = y^2}$,$\boldsymbol{D = 7^2}$, $\boldsymbol{E = 8^{-1}}$, $\boldsymbol{F = 3^{-1}}$								
12	Find the region for which the second order linear PDE $A(x,y)\frac{\partial^2 u}{\partial x^2}+B(x,y)\frac{\partial^2 u}{\partial x\partial y}+C(x,y)\frac{\partial^2 u}{\partial y^2}+D(x,y)\frac{\partial u}{\partial x}+$, is $E(x,y)\frac{\partial u}{\partial y}+F(x,y)=0$ parabola/Hyperbola/Ellipse for following values of A, B, C, D, E ,F $\boldsymbol{A = x^2}$, $\boldsymbol{B = x^2}$, $\boldsymbol{C = x^2}$,$\boldsymbol{D = x^2}$, $\boldsymbol{E = x^2}$, $\boldsymbol{F = x^2}$	5	K1	L	N	PDE	Classification of PDE	5	2
13	Classify the following 2nd order homogeneous linear differential equations. Show the details of your work: $(i)\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2},(ii)\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2},$ $(iii)\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$	5	K4	L	N	PDE	Classification of PDE	5	2
14	Classify the partial differential equation $(x^2-y^2)u_{xx}+2(x^2+y^2)u_{xy}+(x^2-y^2)u_{yy}=0$ for region x>0, y>0.	5	K4	M	Y	PDE	Classification of PDE	5	2
15	Find region in which partial differential equation $(x^2)u_{xx}-x(y^2-1)u_{xy}+y(x^2-y^2)u_{yy}=0$ is hyperbolic? **[GATE2011]**	5	K1	M	Y	PDE	Classification of PDE	5	2
16	Solve partial differential equations :**(Exa. 9.15/9.30/J)** $\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}$	5	K3	M	N	PDE	Method of Separation of Variable	5	6
17	Solve partial differential equations : $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}$	5	K3	M	N	PDE	Method of Separation of Variable	5	6
18	Solve partial differential equations : $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$	5	K3	M	N	PDE	Method of Separation of Variable	5	6

19	Solve partial differential equations : $$\frac{\partial^2 u}{\partial x^2}=5\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}$$	5	K3	M	N	PDE	Method of Separation of Variable	5	6
20	Use separation of variables method to solve following PDE: **(9,10/Exc. 9.4/9.50/J)** $$\frac{\partial u}{\partial t}=\frac{\partial u}{\partial x},\ u(0,x)=2e^{-3x}$$	5	K3	M	N	PDE	Method of Separation of Variable	5	6
21	Let u(x,t) be the solution of initial value problem $u_t-u_{xx}=0,\ u(x,0)=\sin x\ ;\ u_x(x,0)=1.$ Then find value of , $u(\pi,\pi/2)$? [**GATE2006**]	5	K3	H	Y	PDE	Heat Equation	5	6
22	Find the solution of initial value problem $u_t=u_{xx}=0$, $0<x<\pi, t>0, u(0,t)=0, u(\pi,t)=0$ and $u(x,0)=3\sin 2x.$ [**GATE2009**]	5	K3	H	Y	PDE	Heat Equation	5	6
23	Let u(x,t) be the solution of initial value problem $u_{tt}-4u_{xx}=0,\ u(x,0)=\sin x\ ; u(0,t)=u(\pi,t)$ $u_t(x,0)=0.$ Then find value of , $u(\pi/2,\pi/2)$? [**GATE2010**]	5	K3	H	Y	PDE	Wave Equation	5	6
24	Use separation of variables method to solve following PDE: $$(i)\,4\frac{\partial u}{\partial t}+\frac{\partial u}{\partial y}=u,\ u(0,y)=4e^{-3y}$$ $$(ii)4\frac{\partial u}{\partial t}+\frac{\partial u}{\partial y}=u,\ u(0,y)=4e^{-3y}-2e^{y}+5e^{-2y}$$	5	K3	M	N	PDE	Method of Separation of Variable	5	6
25	Solve the following initial boundary value problem corresponding to the one-dimensional wave equation: $$\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}, 0<x<l, t>0, u(0,t)=u(l,t)=0,$$ $$u(x,0)=x(l-x), \frac{\partial u}{\partial t}(x,0)=0$$	5	K3	M	N	PDE	Wave Equation	5	9/10
26	Solve the following initial boundary value problems corresponding to the one-dimensional heat equation:	5	K3	M	N	PDE	Heat Equation	5	9/10

	$\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}, 0<x<\pi, t>0, u(0,t)=u(\pi,t)=0,$ $u(x,0)=T(a\,constant)$								
27	Find the steady-state solutions (temperatures) in the square plate $0\le x\le 2, 0\le y\le 2$ if the upper side is kept at the temperature $1000\sin(1/2)\pi x$ and the other sides are at 0^0.	5	K3	M	N	PDE	Laplace Equation	5	9/10
28	Solve the following one-dimensional wave equation: $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}, 0<x<l, t>0, u(0,t)=u(l,t)=0,$ $u(x,0)=\sin\frac{\pi x}{l}-5\sin\frac{3\pi x}{l}, \frac{\partial u}{\partial t}(x,0)=0$	5	K3	M	N	PDE	Wave Equation	5	9/10
29	Solve the following one-dimensional heat equation: $\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}, 0<x<l, t>0, u(0,t)=u(l,t)=0,$ $u(x,0)=x$	5	K3	M	N	PDE	Heat Equation	5	9/10
30	Solve the Laplace equation by the separation of variables method: $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0, 0<x<l, 0<y<\infty, u(0,y)=u(l,y)=u(x,\infty)=0,$ $u(x,0)=f(x).$	5	K3	M	N	PDE	Laplace Equation	5	9/10
31	An elastic string of length l which is fastened at the ends $x=0$ and $x=l$. Motion is started by displacing the string in the form $y=a\sin\frac{\pi x}{l}$ from which it is released from rest at t=0. Show that the displacement of the string at any instant of time is $y=a\sin\frac{\pi x}{l}\cos\frac{\pi ct}{l}$	5	K3	M	N	PDE	Wave Equation	5	9/10
32	An elastic string of length l which is fastened at the ends $x=0$ and $x=l$ is released from its horizontal position (zero initial displacement) with initial velocity $g(x)$ given as: $g(x)=\begin{cases} x, & 0\le x\le l/3 \\ 0, & l/3<x<l \end{cases}$ Find the displacement of the string at any instant of time. **(Exa.9.18/9.41/J**	5	K3	M	N	PDE	Wave Equation	5	9/10
33	Solve the following initial boundary value problem corresponding to the one-dimensional wave equation: $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}, 0<x<l, t>0, u(0,t)=u(l,t)=0,$	5	K3	M	N	PDE	Wave Equation	5	9/10

	$u(x,0) = x(l-x), \frac{\partial u}{\partial t}(x,0) = 0$								
34	Solve the following initial boundary value problem corresponding to the one-dimensional heat equation: $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}, 0 < x < \pi, t > 0, u(0,t) = u(\pi,t) = 0,$ $u(x,0) = T(a\,cons\tan t)$ (23/Exc.9.4/9.51/J)	5	K3	M	N	PDE	Wave Equation	5	9/10
35	Find the temperature in a laterally insulated bar of length *L* whose ends are kept at temperature 0, assuming that the initial temperature is $f(x) = \begin{cases} x, & 0 < x < L/2 \\ L - x, & L/2 < x < L \end{cases}$.**(Exa.3/562/K)**	5	K3	H	N	PDE	Heat Equation	5	9/10
36	Find the temperature in a laterally insulated bar of length 1(one) whose ends are kept at temperature 0, assuming that the Boundary conditions are $u(0,t) = 0, u(1,t) = 0, u(x,0) = 3\sin n\pi x$ for $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$	5	K3	M	N	PDE	Heat Equation	5	9/10
37	Find the temperature in a laterally insulated bar of length *L* whose ends are suddenly cooled at 0 degree C and kept at that temperature, was initially at a uniform temperature u_0.	5	K3	M	N	PDE	Heat Equation	5	9/10
38	Find the solution of initial value problem $u_t = u_{xx} = 0$, $u(0,t) = 0, u(\pi,t) = 0$ and $u(x,0) = \cos x \sin 5x$. [**GATE2012**]	5	K3	H	Y	PDE	Heat Equation	5	9/10
39	Let u(x,t) be the solution of initial value problem $u_{tt} - u_{xx} = 0,\ u(x,0) = \cos 5\pi x\ ;\ u_t(x,0) = 0.$ Then find value of , $u(1,1)?$ [**GATE2013**]	5	K3	H	Y	PDE	Wave Equation	5	9/10
40	Let u(x,t) be the solution of initial value problem $u_{tt} - u_{xx} = 0,\ u(x,0) = 0\ ;\ u_t(x,0) = \cos x.$ Then find value of , $u(0, \pi/4)?$	5	K3	H	Y	PDE	Wave Equation	5	9/10
41	The boundary value problem governing the steady-state temperature distribution in a flat, thin, rectangular plate of width a and insulated surface is given by $u(0,y) = 0, u(a,y) = 0, u(x,\infty) = 0, u(x,0) = kx$. Find steady state temperature in plate.	5	K3	M	N	PDE	Laplace Equation	5	9/10